

The background is a dark grey chalkboard with various white chalk sketches. In the top left, there's a large 'V' and a globe showing continents. Below the 'V' is a detailed drawing of a microscope. In the bottom left, there's a stack of books. In the bottom center, there's an open book with some handwritten text. In the bottom right, there are mathematical symbols like a percentage sign, an exclamation mark, and a less-than sign.

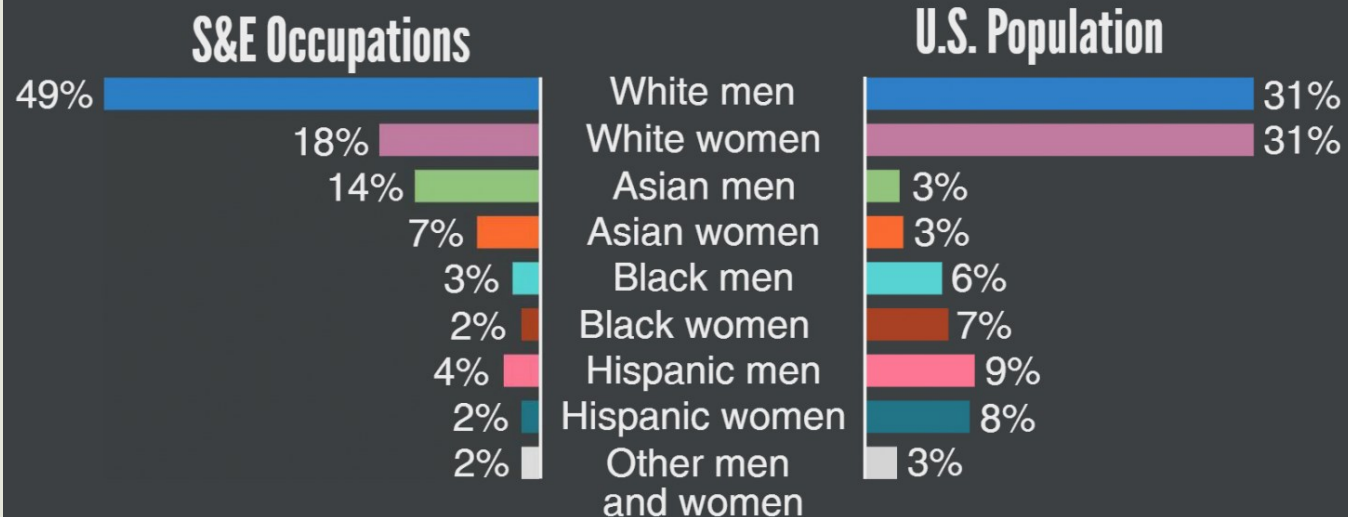
# Rock Stars of Geology

By Meredith Paige Sullivan  
A with Honors project for ESC 102-051W  
Julie Angel  
December 13, 2017

While women have been a driving force in the scientific community for decades, there is a surprising lack of women who pursue careers in science.

# Workers in science and engineering occupations

In 2015, women and some minority groups were represented less in science and engineering (S&E) occupations than they were in the U.S. general population.



Source: National Center for Science and Engineering Statistics, National Science Foundation  
Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017  
<https://nsf.gov/statistics/wmpd/>



# Why Aren't There More Women in Science?

- Bullying by peers

- Ex. "You're a girl and girls aren't good at science."

- Stereotypes within our culture

- Ex. "Science isn't feminine." Science is frequently viewed as a masculine profession. We often see this stereotype reinforced in the media.

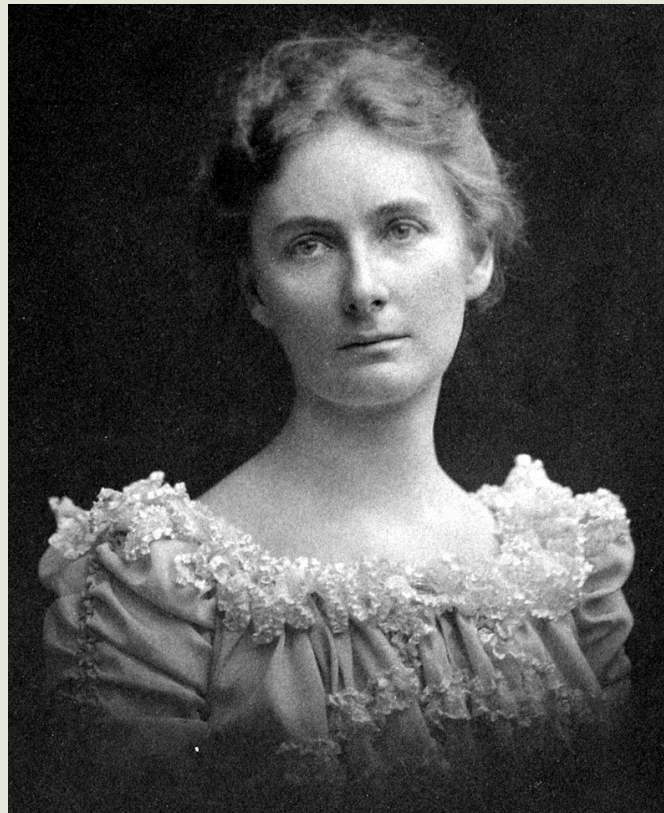
- Bias within the scientific community

- Women are often sidelined, receiving less office or lab space, less money than male colleagues, and less recognition for their accomplishments.

- No encouragement

- Oftentimes, girls interested in pursuing careers in science experience a lack of encouragement from their peers, family, or teachers.

Although women are underrepresented in the scientific community, they have made countless contributions to the scientific field. We will be focusing on women who have had an impact in the field of Geology.



"File:Florence Bascom2.jpg." *Wikimedia Commons, the free media repository.* 19 Oct 2016,  
[https://commons.wikimedia.org/w/index.php?title=File:Florence\\_Bascom2.jpg&oldid=210208935](https://commons.wikimedia.org/w/index.php?title=File:Florence_Bascom2.jpg&oldid=210208935).

# FLORENCE BASCOM

Geologist



## Early Life

- Florence Bascom was born in Williamstown, Massachusetts on July 14, 1862.
- Her parents, John Bascom and Emma Curtiss Bascom, were both teachers who supported the women's suffrage movement.
- When Bascom developed an interest in geology, her parents encouraged her education.
- In 1874, Bascom's father became president of the University of Wisconsin-Madison. One year later, the University began admitting women.

# Education

- Bascom enrolled at the University of Wisconsin-Madison in 1877.
- In 1882, she obtained a bachelor's degree in Arts and Letters.
- In 1884, she obtained her Bachelor of Science degree.
- A short time later, Bascom began studying geology, and in 1887 she was awarded a Master of Science degree.
- Bascom decided to continue her education, pursuing a Ph.D. She enrolled at Johns Hopkins University.
- While at Johns Hopkins University, Bascom was made to sit behind a screen during classes, so as not to “distract” her male counterparts.
- Bascom completed her Ph.D. in 1893 and became the 1<sup>st</sup> woman to receive a Ph.D. from Johns Hopkins University.



# Work

Bascom was skilled in several areas of geology:

- Crystallography, which focuses on the arrangement of atoms in crystals
- Mineralogy, which is the study of minerals
- Petrography, which focuses on the classification and description of rocks
- Bascom was also an educator, teaching at several colleges throughout her career.
- In 1895, she began teaching at Bryn Mawr, which at the time was a women's college.
- While at Bryn Mawr, Bascom created the geology Department. She also mentored many students who went on to become accomplished geologists in their right.

# Legacy

Bascom had many 1sts in her lifetime.

- 1896 – 1<sup>st</sup> woman to work for the U.S. Geographical Survey
- 1901 – 1<sup>st</sup> woman to give a presentation to the Geological Society of Washington
- 1924 - elected to the Council of the Geographical Society of America, making her the 1<sup>st</sup> woman to hold that position
- 1930 – 1<sup>st</sup> female vice president of the Geographical Society of America



"Dr. Inge Lehmann." *American Museum of Natural History*, [www.amnh.org/explore/resource-collections/earth-inside-and-out/inge-lehmann-discoverer-of-the-earth-s-inner-core/](http://www.amnh.org/explore/resource-collections/earth-inside-and-out/inge-lehmann-discoverer-of-the-earth-s-inner-core/).

# INGE LEHMANN

Seismologist/Geophysicist



## Early Life

- Inge Lehmann was born on May 13, 1888 in Copenhagen, Denmark to Alfred Georg Ludvik Lehmann and Ida Sophie Tørsleff.
- Alfred was a psychologist and Ida was a housewife. They both came from well-to-do families.
- Lehmann was very shy and did not enjoy being the center of attention, a trait that followed her for the rest of her life.

# Education

## Early Education

- Lehmann attended Fællesskolen, a co-ed, private school.
- At Fællesskolen, both male and female students studied the same subjects and were allowed to participate in the same sports and activities, which was uncommon at that time.

# Education

## College

- Lehmann began attending Copenhagen University in 1907, where she studied chemistry, physics, and math.
- In 1910, she attended Newnham College, Cambridge for one year, before returning home.
- Lehmann did not graduate until 1920. Due to the sexism she experienced while attending university, she became overwhelmed and dropped out of school. She began working for an insurance company. She worked there until 1918, when she re-enrolled.
- Lehmann obtained a degree in Mathematics in 1920.
- In 1928, Inge received a master's degree in Geodesy, which involves making measurements of the Earth.
- In 1964, she obtained a Doctor of Science degree from Columbia University in New York.

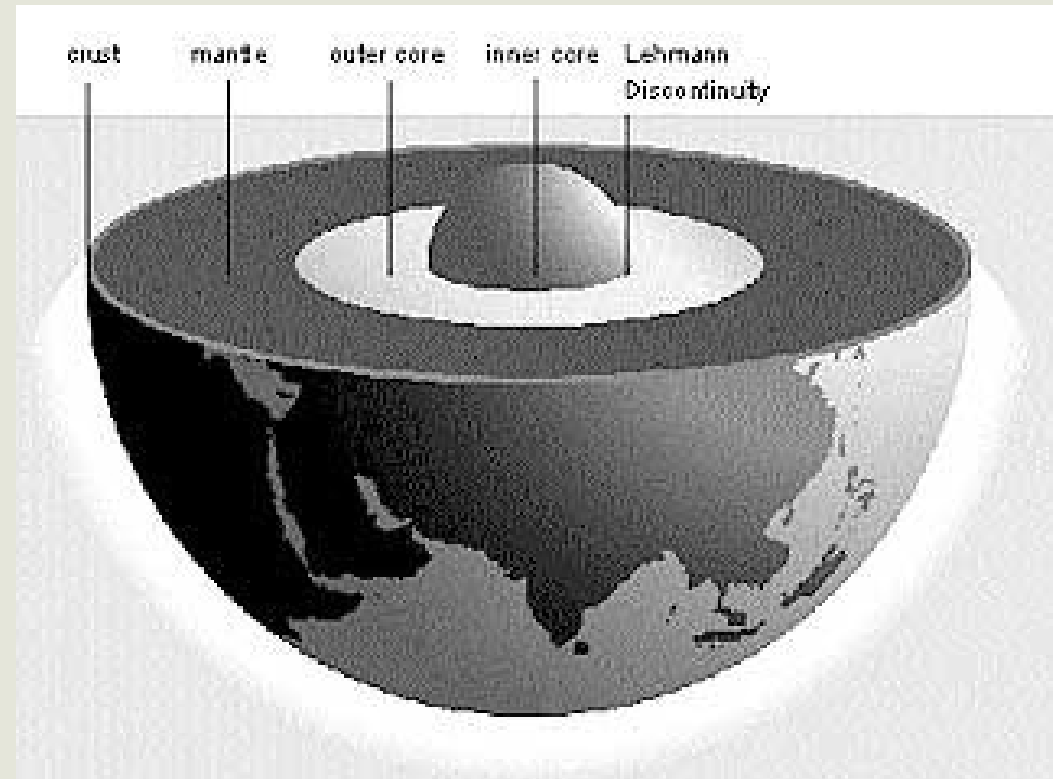


# Work

- Lehmann was selected to be the head of the Department of Seismology at the Royal Danish Geodetic Institute in 1928, where she oversaw several seismographic observatories.
- In her spare time, she conducted research on improving the techniques used to analyze measurements from various seismographic observatories in Europe.
- In 1936, Lehmann authored a paper, in which she proposed that the earth's center was comprised of a solid inner core and a liquid outer core, with a boundary separating them. That hypothesis was controversial at the time.
- In 1953, Lehmann retired from the Geodetic Institute and began focusing on scientific research.
- Lehmann had several publications. Her last scientific article, *Seismology in the Days of Old*, was published in 1987, when she was 99 years old!

# Legacy

In 1970, Lehmann's hypothesis from 1936 was proven to be correct. Previously, it was believed that the earth had a liquid core, a solid mantle, and was enclosed by a crust. The boundary that Lehmann had noted in her paper is known as the Lehmann Discontinuity.



"Cut Away Showing the Four Main Layers of Earth." American Museum of Natural History, American Museum of Natural History, [www.amnh.org/explore/resource-collections/earth-inside-and-out/inge-lehmann-discoverer-of-the-earth-s-inner-core/](http://www.amnh.org/explore/resource-collections/earth-inside-and-out/inge-lehmann-discoverer-of-the-earth-s-inner-core/).

## Legacy cont.

- Lehmann received many awards and honors throughout her long career.
- On May 15, 2015, Google celebrated Lehmann's 127<sup>th</sup> birthday with a Google Doodle.
- The Inge Lehmann medal was established by the American Geophysical Union in 1997. It is awarded for exceptional work relating to the composition and structure of the earth.



“Elisabeth Toubro Creates Monument for Inge Lehmann at Frue Plads.” *NY Carlsberg Fondet*, New Carlsberg Foundation, 2017, [www.ny-carlsbergfondet.dk/en/Aktiviteter/Bevillinger/Bevillinger/Inge-Lehmann](http://www.ny-carlsbergfondet.dk/en/Aktiviteter/Bevillinger/Bevillinger/Inge-Lehmann).





NASA - <http://photojournal.jpl.nasa.gov/catalog/PIA03708>

# MARIE MORISAWA

Geomorphologist

## Early Life

- Marie Morisawa was born in Toledo, Ohio on November 2, 1919.
- Morisawa was Japanese American, her mother American, and her father Japanese.
- She embraced both cultures, but took great pride in her Japanese heritage.



# Education

- Morisawa attended Hunter University in New York, where in 1941, she received a Bachelor of Science degree in Mathematics.
- She also received a Master of Arts degree in religious education from the Union Theological Seminary. Upon graduation, she began teaching religious studies in Hawaii.
- Several years later, she decided to change her focus to geology. She obtained a master's degree from the University of Wyoming in 1952, where she was the only female out of 40 graduates.
- Shortly after, she began attending Byrn Mawr, before switching to Columbia, receiving her Ph.D. in 1960.



# Work

- While attending Byrn Mawr, Morisawa was introduced to Arthur Strahler at Geological Society of America meeting. Strahler worked at Columbia University and he offered her a research fellowship there.
- At Columbia, Morisawa took part in a U.S. Office of Naval Research project involving geomorphology (the study of the development of landforms).
- Though she was interested in all areas of geomorphology, streams were the most fascinating to her. She published several books and articles about streams that are still highly regarded today.
- Morisawa taught at several universities throughout her career, including Byrn Mawr, Antioch College, and Binghamton University.
- In 1970, Morisawa and her fellow geomorphologist Donald Coates, founded the Binghamton Geomorphology Symposium, an annual symposium that is still held today.
- In 1986, assisted in starting the scientific journal, *Geomorphology*.
- Morisawa experienced many instances of sexual discrimination throughout her career. One example was in 1952, when recruiters from an oil company refused to hire her as a geologist, but offered her a position as a secretary.

# Legacy

- Morisawa was the 1<sup>st</sup> woman to serve as chair on the Geological Society of America's Quaternary Geology and Geomorphology Division.
- In 2006, the Geological Society of America established the Marie Morisawa Award to aid female students pursuing a career in geomorphology.
- Throughout her career, Morisawa received recognition and several awards for her work. One award that she was very proud of was the Outstanding Educator Award, given to her in 1992 by the Association of Women Geoscientists.





Sullivan Views the Earth - GPN-2000-001082

[https://commons.wikimedia.org/wiki/File%3ASullivan\\_Views\\_the\\_Earth\\_-\\_GPN-2000-001082.jpg](https://commons.wikimedia.org/wiki/File%3ASullivan_Views_the_Earth_-_GPN-2000-001082.jpg)

By NASA (Great Images in NASA Description) [Public domain], via Wikimedia Commons from Wikimedia Commons

# KATHRYN D. SULLIVAN

Geologist



# Early Life and Education

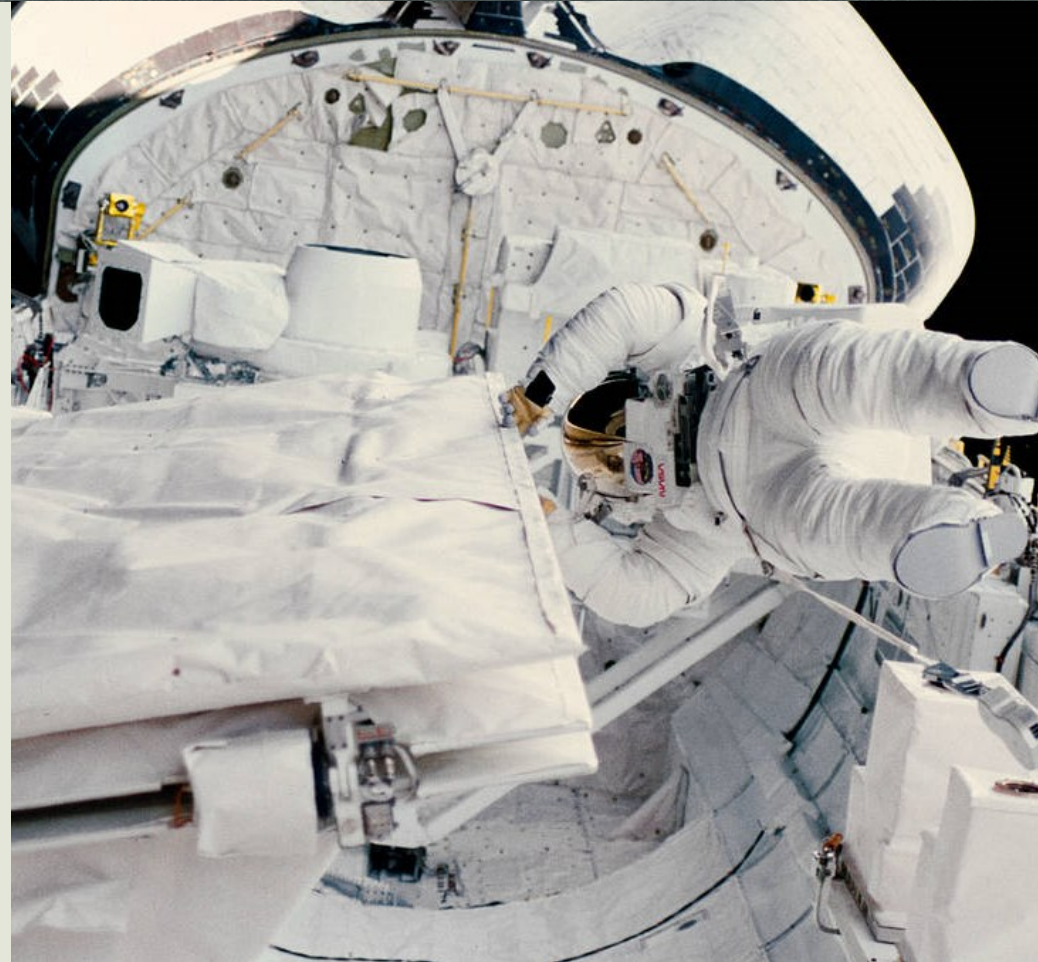
- Kathryn Sullivan was born in Paterson, New Jersey on October 3, 1951 to Donald and Barbara Sullivan.
- Though she was born in Paterson, she thinks of Woodland Hills, California as her hometown.
- In 1969, Sullivan graduated from Taft High School in Woodland, California.
- Shortly after, she began attending the University of California, Santa Cruz, where she studied Earth Sciences. She received a Bachelor of Science degree in 1973.
- In 1978, she obtained a Doctorate in Geology from Dalhousie University in Nova Scotia.
- While at Dalhousie, as part of her doctorate program, she studied Oceanography, participating in several expeditions.

# Work

- In 1978, shortly after completing her doctorate, NASA offered Sullivan a position in the astronaut corps. In August of 1979 she became one of the first females selected by NASA to join the corps.
- Sullivan completed three shuttle missions while at NASA, logging more than 530 hours in space.
- Sullivan left NASA in 1993, when she received a presidential appointment as chief scientist at the National Oceanic and Atmospheric Administration (NOAA).
- In 1988, she joined the U.S. Naval Reserve, working as an oceanographer. She retired in 2006.
- In 1996, she became the President and CEO of the Center of Science and Industry. She remained there for ten years.
- She was also the Director of the Battelle Center for Mathematics and Science Education Policy for years.
- She held the position of NOAA Administrator from March 2013-January 2017.

# Legacy

- Sullivan was the 1<sup>st</sup> American woman to walk in space.
- Sullivan was a member of the *Discovery* shuttle crew that deployed the Hubble Telescope on April 25, 1990.
- During Sullivan's first shuttle mission, STS-41G, she worked alongside Sally Ride. This mission marked the 1<sup>st</sup> time two women were on a crew.
- Sullivan has received many awards, medals, and honors, including her induction into the Astronaut Hall of Fame on May 1, 2004.
- Sullivan is currently serving as the Charles A. Lindbergh Chair of Aerospace History at the Smithsonian's National Air and Space Museum. While in this position, she plans to write a book about satellites.



"Kathryn Sullivan Space Walk." NASA, NASA, 5 Oct. 2015, [www.nasa.gov/image-feature/astronaut-kathryn-sullivan-on-oct-11-1984-spacewalk](http://www.nasa.gov/image-feature/astronaut-kathryn-sullivan-on-oct-11-1984-spacewalk).





<http://www.esri.com/esri-news/arcuser/winter-2014/saving-the-blue-stuff>

# DAWN WRIGHT

Geographer/Oceanographer

## Early Life

- Dawn Wright was born in Baltimore, Maryland on April 15, 1961 to Jeanne and Robert Wright.
- Though she was born in Baltimore, Wright grew up in Maui, Hawaii.



"Dawn Wright as a Child." *The Atlantic*, The Atlantic, 13 Dec. 2011, [www.theatlantic.com/national/archive/2011/12/a-conversation-with-dawn-wright-chief-scientist-of-the-environmental-systems-research-institute/249780/](http://www.theatlantic.com/national/archive/2011/12/a-conversation-with-dawn-wright-chief-scientist-of-the-environmental-systems-research-institute/249780/).

# Education

- Wright graduated from Wheaton College cum laude with a Bachelor of Science degree in Geology in 1983.
- In 1986, she obtained a Master of Science degree in Oceanography from Texas A&M University.
- She also received an Interdisciplinary Ph.D. in Physical Geography and Marine Geology from the University of California, Santa Barbara in 1994.



Wright, Dawn. "Dawn Wright, Graduation." *Deepsea Dawn Profile*, Oregon State University, 17 June 2017, [dusk.geo.orst.edu/bio.html](http://dusk.geo.orst.edu/bio.html).



# Work

- The National Oceanographic and Atmospheric Administration (NOAA) offered Wright a research position, following the completion of her Ph.D.
- She began teaching at Oregon State University, in the Department of Geosciences in 1995.
- She has traveled around the world mapping the ocean floor and has published many scientific papers and books.
- Wright is currently the chief scientist at the Environmental Systems Research Institute.

# Legacy

- Wright has received numerous honors and awards for her work, which includes winning U.S. Professor of the Year for the State of Oregon.
- Wright serves on many boards, including the NOAA Science Advisory Board and the Science Advisory Council of Conservation International.
- Wright is also an advocate for more outreach programs that encourage females and minorities to pursue careers in science.



"Dawn Wright, Pictured in Her New Office at Esri." *Diving into Esri's Ocean and Natural Science Initiatives: Dawn J. Wright Sets Course as Esri's New Chief Scientist*, Esri, Jan. 2012, [www.esri.com/news/arcwatch/0112/diving-into-esri-ocean-and-natural-science-initiatives.html](http://www.esri.com/news/arcwatch/0112/diving-into-esri-ocean-and-natural-science-initiatives.html).





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Interested in getting involved  
in science?



# The Girl Scouts

## “It’s Your Planet—Love It!”

- The Girl Scouts have a program called “It’s Your Planet—Love It!”.
- The program covers topics such relating to the environment, such as recycling and soil contamination.
- To learn more about this program, you can visit <http://www.girlscouts.org/en/our-program/journeys/it-s-your-planet--love-it-.html>.

- For inquiries about local chapters, you can call the Girl Scouts of Central Illinois Customer Care line at 888-623-1237.

## “Girl Scout Ranger Program”

- The Girl Scouts also have a program called “The Girl Scout Ranger Program.”
- The Girl Scouts partnered with the National Park Service to create this program. Girls are able to participate in a number of projects at a National Park location. You can choose from the listed programs or you can create your own project.
- To learn more, you can visit <https://www.nps.gov/subjects/youthprograms/girlscoutranger.htm>

# Orpheum Children's Science Museum

- The Orpheum has many exhibits, including an archaeology field station, an excavation box, which University of Illinois geology grad students designed, and a water flume that the U.S. Geological Survey donated.
- For more information, visit <http://www.orphelumkids.net/exhibits/> or call 217-352-5895.
- The Orpheum is located at 346 N Neil Street, in Champaign.



"Archaeology Exhibit at the Orpheum Children's Science Museum." Orpheum Children's Science Museum, WordPress, [www.orphelumkids.net/exhibits/](http://www.orphelumkids.net/exhibits/).

# Champaign county Forest Preserves

## Homer Lake

- The Homer Lake Forest Preserve is a great place to go to experience and learn about nature.
- The Homer Lake Interpretive Center has several science related kits that they loan to visitors, such as GPS units and water quality kits.
- For more information, visit <http://www.ccfpd.org/education/interpretive-center-homer-lake#resourcesForLoan> or call 217-896-2455

## Museum of the Grand Prairie

- The Museum of the Grand Prairie offers several programs relating to science and the environment, such as a program about the ecosystems of Illinois and a program that teaches you how to identify different types of trees.
- For more information, visit <http://www.ccfpd.org/education/middle-high-school> or call 217-586-3360.



# World of Science Lectures

- The William M. Staerkel Planetarium at Parkland College offers monthly science lectures.
- A local scientist discusses a different topic each month. Some of the upcoming topics are “Chasing Tornadoes” and “Extending Plate Tectonics Into the Deep Interior Using Supercomputers.”
- The lectures are on the first Friday of the month at 7pm and it only costs \$2 to get in!
- For the full schedule, visit <http://www2.parkland.edu/planetarium/lectures.html>.

Bascom, Lehmann, Morisawa, Sullivan, and Wright faced many challenges in pursuit of science, but they persevered and went on to accomplish great things, paving the way for generations of women to come. Who knows? You could be the next Rock Star of Geology!

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